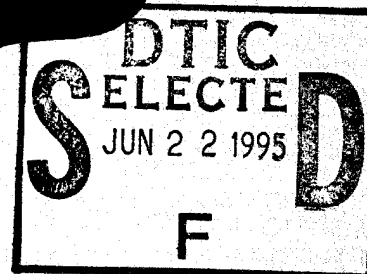


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STRATEGY RESEARCH PROJECT



ENGAGEMENT AND DISARMAMENT: A U.S. NATIONAL SECURITY STRATEGY FOR BIOLOGICAL WEAPONS OF MASS DESTRUCTION

BY

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**ENGAGEMENT AND DISARMAMENT:
A U.S. NATIONAL SECURITY STRATEGY
FOR
BIOLOGICAL WEAPONS OF MASS DESTRUCTION**

by

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ABSTRACT

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TITLE: **Engagement and Disarmament: A U.S. National Security Strategy for Biological Weapons of Mass Destruction**

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The specter of biological weapons -- one of the three weapons of mass destruction (WMD) -- is an unusual and extraordinary threat to the national security of the United States. Since the U.S. unilaterally renounced biological warfare in 1969, biotechnology advances, aggressive nation-states, and terrorism have complicated a precarious balance of world and regional stability. U.S. shortfalls in biological warfare preparedness during the Persian Gulf War may convince potential adversaries that the U.S. is incapable of protecting its vital interests from biological assault. This paper examines the menace of biological weapons and global challenges to nonproliferation and counterproliferation. Analysis concludes that the United States can dissuade, deter, and defend against biological warfare and terrorism with an integrated national security strategy for *Biological Weapons Engagement and Disarmament*.

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LIST OF ABBREVIATIONS

ACDA	Arms Control and Disarmament Agency.
BDRP	Biological Defense Research Program.
BW	Biological warfare.
BWC	Biological Warfare Convention (1972).
CBM	Confidence building measure.
CBW	Chemical and biological warfare.
CDC	Centers for Disease Control and Prevention.
CIA	Central Intelligence Agency.
CW	Chemical warfare.
DHS	Defense Human Intelligence Service.
DNA	Deoxyribonucleic acid.
DoD	Department of Defense.
FBI	Federal Bureau of Investigation.
FEMA	Federal Emergency Management Agency.
FROG	Free rocket over ground [missile].
HUMINT	Human intelligence.
MCA	Monoclonal antibody.
MTCR	Missile Technology Control Regime.
NPC	Nonproliferation Center.
RC	Review Conference [to the Biological Weapons Convention].
rDNA	Recombinant deoxyribonucleic acid.

SCUD	North Atlantic Treaty Organization (NATO) codename for family of heavy artillery battlefield rockets originally produced by the United Soviet Socialist Republics [currently Russia and the new republics of the Former Soviet Union].
SOF	Special Operating Forces.
SS	Surface to surface [missile].
Su-	Sukhoi [aircraft manufacturer].
UN	United Nations.
UNSCOM	United Nations Special Commission.
USAMRIID	United States Army Medical Research Institute of Infectious Diseases.
VEREX	Verification Experts.
WHO	World Health Organization.
WMD	Weapons of Mass Destruction.

**Engagement and Disarmament:
A U.S. National Security Strategy for Biological Weapons of Mass Destruction**

I. INTRODUCTION

Global Danger of Proliferation: Weapons of Mass Destruction

The specter of confronting weapons of mass destruction (WMD) in conflicts is high. Nuclear, chemical, and biological weapons and the means to deliver them are more widespread as the world approaches the 21st Century. Five nations have declared a nuclear weapon arsenal while several other nations possess or have active nuclear weapon development programs. As of early 1995, over two dozen countries possessed or were researching-developing chemical warfare (CW) programs. In many instances, biological weapons programs have followed closely behind such CW programs.¹ The number of countries developing or engaging in offensive biological warfare (BW) programs increased from 4 in 1972 to 10 by 1992.² The number of BW proliferators has tripled since 1972.³ Many of the most likely adversaries of the United States already possess chemical or biological weapons.⁴

Specific biological agents, including toxins, are extremely potent and provide potential for the widest contamination and most damage of any WMD system.⁵ The U.S. President recognized this growing danger and declared biological weapons proliferation a "national emergency" in 1991. He labeled these weapons an unusual and extraordinary threat.⁶

Today, the U.S. confronts the particular danger of biological warfare with national and international programs to prevent and counter the proliferation of BW and their delivery means.⁷ The U.S. protects the nation and its citizens with plans to dissuade and deter use of such terrible weapons, and if necessary, defend against biological attack. The United States must be clear and deliberate in its strategy to deter aggression, encourage peaceful resolution of critical regional conflicts, enhance foreign markets access, and cooperate with regional partners to enforce security

and stability in regions of the world.⁸ As a global power, the U.S. must lead a strategy of biological weapons nonproliferation and counterproliferation in order to protect its national security interests and world safety.

II. PURPOSE

*As the world's greatest power, we have an obligation to lead and, at times when our interests and our values are sufficiently at stake, to act.*⁹

The President of the United States

This paper examines the menace of biological weapons and global challenges to BW nonproliferation and counterproliferation. Analysis will determine the ability of the United States to dissuade, deter, and defend against biological warfare and terrorism with an integrated U.S. national security strategy for *Biological Weapons Engagement and Disarmament*.

III. A BIOLOGICAL WARFARE PERSPECTIVE

Why Biological Warfare?

Ultimately, the primary objective of biological attack is man. It uses living organisms or their toxic products to cause death, disability, or damage to man, domestic animals, or crops. Attack can be a direct physiological or psychological assault, or an indirect assault such as damaging domestic animal populations or limiting food and crop supplies. BW purpose can be categorized as antipersonnel, antianimal, or anticrop.¹⁰ In some cases, BW can have antimaterial effects such as deterioration of critical equipment components.

World War II: A Tarnished History

The United States determined biological warfare was a distinctly feasible threat during early World War II, and took defensive measures by 1942 to deter its use.¹¹ Similar BW research in the United Kingdom had begun in the 1930s with protection as a primary interest. The primary

objective of Allied programs was defensive. As the war progressed, the Allies investigated the ability to retaliate in kind against people, animals, and crops. Germany's suspected BW research and development were the principle concern.¹² Fortunately, Germany never developed an offensive biological warfare program and produced no BW munitions.¹³

As the other primary belligerent to the Allies in World War II, Japan actively pursued an offensive biological warfare program with experiments and operations beginning in the 1930s. Civilians and soldiers in China were victims of human experiments with a variety of BW agents. After the war, the U.S. granted immunity from war crimes prosecution to certain Japanese BW participants in return for their technical research and findings.¹⁴

The Soviet Union conducted BW research by the 1930's also. Little is publicized about their pre-war or World War II capabilities.¹⁵ However, post-war assessments of the 1950s and 1960s credited them with a significant BW capability.¹⁶ Cold War rhetoric on weapons of mass destruction encouraged mutual suspicion of national strategy intentions.¹⁷

Cold War Suspicion and Beyond

The U.S. retained biological warfare weapons and means of delivery developed during World War II, and expanded its strategic biological arsenal through the 1950s and 1960s. U.S. analysis of biological warfare continued to stress its special devastating effects and lack of any adequate detection system. Methods included cluster bomblets carried by aircraft and missiles, spraying munitions carried by aircraft and missiles, and spray tanks on aircraft and drones.¹⁸

The Soviets were forthright in declaring the practical aspects of BW mass casualties as a calculated result of employing WMD.¹⁹ They built a large national infrastructure devoted to development and production of offensive biological warfare.²⁰

The Big Leap

In 1969, the President of the United States made a key decision to unilaterally renounce the use of lethal or nonlethal BW. Justification included its questionable strategic or operational value as a weapon, and the desire to control an arms race with a relatively unpredictable weapon.²¹ All U.S. offensive biological warfare stockpiles were destroyed.²²

The Biological Warfare Convention

The 1972 Biological Warfare Convention (BWC) is a significant milestone in BW nonproliferation..²³ Its aim is nonproliferation of biological weapons. This declaration bans the development, production, stockpiling, acquisition, and retention of these type of weapons, and reiterates the nonuse obligations of the 1925 Geneva Protocol. The convention does *not* preclude biological agents or toxins used for medical, defensive, or other peaceful purposes.²⁴

Over 130 nations of the world are signatories of the BWC to include the United States, Iraq, Iran, Libya, North Korea, China, and Russia. All prohibited materiel of each member nation was to be destroyed within nine months of the convention's entry into force. The United States is in full compliance with the BWC.²⁵ This is not true of several other signatory nations. No means to verify treaty compliance and irrefutable proof that certain nations have developed BW weapons since signing the convention cause international tension over their possible use.²⁶

The outbreak of inhalation anthrax in Sverdlovsk in 1979 spotlighted recurring allegations that the Soviet Union was maintaining an offensive BW capability in violation of the BWC. Recent revelations confirm that the Soviet Union conducted deliberate deception of BW research activities outside the limitations set by international agreements.²⁷

Some incidents are not as clearly evident. Nations and antagonists allege biological or toxin use on numerous occasions.²⁸ After conflicting reports of "Yellow Rain" in Southeast Asia, scientific investigation confirmed that mycotoxins, products of fungi, were a component of some BW attacks.²⁹ More recently, Iraq's advanced and aggressive BW program was the most extensive in the Middle East.³⁰

Persian Gulf War: An Issue of Deterrence

"...the United States will not tolerate the use of chemical or biological weapons..."³¹

The President of the United States

What deterred use of BW in the Persian Gulf War? The definitive answer is elusive. However, these weapons were not used when a proven Iraqi BW capability existed.³² The international coalition that confronted Iraq used a broad range of political, diplomatic, economic, and military power to psychologically deter that nation's leader from using BW. The United Nations Special Commission (UNSCOM) in post-war Iraq has experienced minimal Iraqi cooperation on qualifying Iraqi biological warfare capabilities and intentions.³³

The Advent of WMD Terrorism

Use of the chemical nerve agent sarin against a civilian population in 1994³⁴ and 1995³⁵ shattered any global complacency that weapons capable of mass destruction will not be used by terrorists or other extremist groups. Bombing of the World Trade Center in 1993³⁶ signaled the increasing boldness of terrorism against U.S. interests. Mass U.S. casualties and loss of lives have stark precedent in the 1983 bombing of the U.S. Marine Corps facilities in Lebanon.³⁷ The 1995 bombing of the Federal Building in Oklahoma City murdered scores and wounded hundreds

of civilians.³⁸ The type and number of recent attacks on American interests around the world illustrate a significant increase in economic and symbolic targets.³⁹ U.S. intelligence estimates note that international terrorists are shifting from hostage-taking and hijacking to indiscriminate slaughter of civilians and greater property damage.⁴⁰

Biological weapons could be the next heinous tool of the terrorist.⁴¹ Experimental data indicates botulinum toxin can be about three million times more potent than the nerve agent sarin.⁴² Belief that WMD use may alienate friendly or neutral constituencies⁴³ and thereby preclude its use is not as convincing in the current maelstrom of radical nationalism, ethnic extremism, religious fundamentalism, and covert state-sponsored terrorism.⁴⁴ Similarly, infecting targets with biological agents for state-sponsored assassination is historical fact.⁴⁵ The image of BW catastrophe due to ideological acts of desperation is a realistic concern.

IV. DEFINING THE BIOLOGICAL MENACE

The Genera of Potential Assault

Biological weapons are disease-causing microorganisms and toxins which can be used as a means of warfare or terrorism. Principle categories of biological or toxin warfare agents are: bacteria, viruses, rickettsiae [rick'-eht-see-ee], fungi and toxins.⁴⁶ Most agents grow in natural environments, but may also thrive in the artificial conditions of a laboratory. Bacteria are microscopic, one-celled organisms widely found in soil, air, bodies of living animals and plants, as well as in dead or decaying matter. Viruses are submicroscopic infective agents which require a living host. Rickettsiae are intercellular parasitic microorganisms which require a living host. Their infection is usually transmitted through a vector such as a flea, tick, or lice. Parasitic plants such as molds, mildews, or mushrooms characterize fungi. Conversely, toxins are non-living

poisons that can be produced by an animal, plant or microbe. Toxins do not reproduce themselves -- a significant difference from bacterial or viral agents. Practical limitations of BW employment reduce the number of open-air, weaponizable toxins to well less than 20.⁴⁷

During the Persian Gulf War, biological weapon agents of most concern were inhalation anthrax, botulism, pneumonic tularemia, Q fever, staphylococcal enterotoxemia, viral influenza, Venezuelan equine encephalitis, Rift Valley fever, dengue fever, and Korean hemorrhagic fever.⁴⁸ Botulism toxin can debilitate in a few hours and kill in as little as 12 hours, but decomposes rapidly after several hours exposure to air. Inhalation anthrax takes two to four days to kill but may contaminate as spores for years.⁴⁹

Effects differ among BW agents. Botulinum toxin causes death through paralysis of respiratory muscles. Anthrax creates ulcerating pustules on the lungs,⁵⁰ and releases toxins which cause death by massive blood poisoning.⁵¹ Some toxins destroy or damage body tissue directly.⁵² Exotic viral hemorrhagic fevers, such as Lassa or Ebola, disrupt the body's blood-clotting mechanisms and cause death by massive internal bleeding and resulting shock.⁵³

The Pestilence That Stalks

Outbreaks of devastating disease are often a natural occurrence. A lethal respiratory disease in the U.S. southwest in 1993 resulted in 27 sudden deaths. Prompt diagnosis by U.S. federal and Army scientists discovered a new virus using modern genetic techniques, and verified that it spread from the contaminated urine of deer mice.⁵⁴ New viruses continue to appear throughout the world with deadly results. In 1994, a highly virulent new virus attacked animal and man in Australia. This was the first time that this family of virus has attacked more than one animal species. While researchers attempt to identify its viral source, indications are that the

virus is not a mutation but a naturally emergent virus.⁵⁵ Strains can build resistance to antibiotics with devastating consequences. Bacteria can mutate and transform a relatively harmless organism into a killer. For example, mutant strains of *Escherichia coli* can produce illness via *Shigella*-like toxins.⁵⁶ The U.S. is no stranger to disease mass casualties. Over 20,000 people died in New York City alone during the 1918 influenza pandemic.⁵⁷

Sometimes man contributes unwittingly to conditions which cause a virulent contagion. The lair of *Legionella* bacterium which causes Legionaire's Disease was the water system of specific air conditioning devices.⁵⁸ Currently, Russia and the new republics of the former Soviet Union are experiencing a diphtheria epidemic. Over 80,000 illnesses and 2,000 deaths have occurred since the outbreak about four years ago. Causes include a mobile population without effective immunization programs, and a sluggish official medical response.⁵⁹

Man has used biological agents purposely for BW. The dilemma is often to determine whether incidents are killing fields of biological warfare or the devastation of natural occurrences.⁶⁰

Biotechnology: Enlightened Science or Grim Frontier?

The scientific breakthrough of genetic engineering in the early 1970s changed microbiology and biotechnology forever. The ability to isolate specific genes and manipulate their basic DNA (deoxyribonucleic acid) advanced numerous avenues in health care, agriculture, and animal science. This recombinant DNA (rDNA) is the product of taking a gene from the DNA of one type of cell and splicing it to the DNA of another type of cell. It can permit the rapid growth and multiplication of particular genetically coded substances.⁶¹ This provides great opportunities in scientific investigation and health care. For example, under ideal conditions, the

bacterium *Escherichia coli* can reproduce from one cell to over one billion cells in about 10 hours.⁶² Unfortunately, there can be a dark side to this application of science.

Lethal components of a bacterium, toxin, organic substance, or fungus can be spliced to otherwise harmless genetic substances in order to create deadly biological agents. The monoclonal antibody (MCA) process produces specific antibodies which are fused to a hardy cancerous cell. When used as a biological weapon, the new signature of the cell hides the actual genetic characteristics and prevents natural immune systems from countering an infection. Diseases can be altered to increase their virility, survivability, and communicability.⁶³ Timely medical diagnosis and treatment are more difficult.

Psychotoxins are another aspect of biotechnology techniques which blur the definition between credible health science and biological-chemical warfare programs. These chemicals can induce distinct changes in mental and physical behavior. Their impact could be profound by incapacitating or causing confused and lethargic reactions of an opponent in a crisis.⁶⁴

Dual-use biotechnology complicates detection of biological warfare programs. Proliferators can mass produce biological agents safely with greater ease and speed of manufacture. This ability shortens the amount of time required to create a militarily significant BW stockpile and correspondingly improves security of surprise attack.⁶⁵

A respirable aerosol is the most likely means of BW attack.⁶⁶ Biological attack presented as a respirable aerosol will act like a cloud rather than droplets. The effectiveness of most agent or toxin particles is very susceptible to wind, evaporation, and heat.⁶⁷ Other routes of infection are contaminated food or water. Standard chlorination of water supplies and natural dilution of toxins in large-scale water supplies make it unlikely that biological weapons would significantly

contaminate water.⁶⁸ However, certain parasitic organisms can survive in chlorinated water and present a danger.⁶⁹ For unprotected civilian populations or armed forces, BW attack could be catastrophic.⁷⁰ Modeling simulations estimate that a BW attack on a city with 30 to 50 kilograms of anthrax could kill 100,000 people.⁷¹

Physical protective measures such as protective masks, clothing, and decontamination systems for chemical attack are, for the most part, effective against these threats. Timely warning prior to attack is critical to ensure that protective equipment is worn.⁷² Available detection systems are currently a weak link to enhancing an effective protective posture against biological weapons attack. Lacking actual field experience with BW, normal decontamination⁷³ as in a chemical attack, is the standard procedure.⁷⁴

Vaccination is the most effective means of preventing casualties for most of the significant biological agents and toxins. Time is critical because the human body may require 4 to 15 weeks to make its own protective antibodies. Vaccinations may require multiple injections over several weeks, or periodic booster injections in order to maintain protection.⁷⁵

The BW Proliferators

Russia remains an enigma for truth concerning active BW programs. Russian President Yeltsin ordered a cessation of all biological activities in violation of the BWC in 1992, but independent verification of compliance is impossible.⁷⁶ Soviet offensive BW programs which Russia inherited were massive with production, weaponization, and stockpiles.⁷⁷ New republics such as Kazakhstan and Uzbekistan cause concern too. They inherited CBW facilities and test ranges from the former Soviet Union but have not acceded currently to the BWC.⁷⁸

The Peoples Republic of China has probably not eliminated its BW program since becoming a party to the Biological Warfare Convention in 1984.⁷⁹

Iraq developed an offensive BW capability and could again.⁸⁰ After the 1991 Persian Gulf War, the UN Special Commission (UNSCOM) on-site inspections reported on Iraq's BW capabilities. Iraq could produce anthrax, *botulinum* toxin, and *clostridium perfringens epsilon* toxin to service a limited weaponization program and support terrorist activities.⁸¹

Iran has produced biological agents and has a BW program which if not already in production, is probably close to production. They have probably weaponized a small quantity of these BW agents.⁸² Their public statements of conducting offensive chemical attacks in military missile exercises indicate a willingness to use WMD in the future.⁸³

North Korea has had the capability for offensive use biological weapons since the 1980s according to intelligence estimates, and cooperated with Syria in biological warfare research.⁸⁴ North Korea's arsenal may include chemical and biological warheads for FROG and SCUD type ballistic missiles.⁸⁵ Developments in the North Korean Nodong-1 missile with a 1000 kilometer or greater range could include chemical-biological warfare (CBW) warheads.⁸⁶

Egypt declared a BW program by 1972. It is highly probable that Syria is developing an offensive biological warfare capability. Libya may have a BW program.⁸⁷ Other potential proliferators of BW are Israel, India, Taiwan, Belarus, South Korea, South Africa, and Pakistan.⁸⁸ Recognizing these persuasive BW threats, the U.S. President affirmed a national priority to combat the spread of weapons of mass destruction and their means of delivery.⁸⁹

Missiles: A Swift and Severe Danger

The threat of ballistic missiles use in regional conflicts has grown enormously over the

past two decades.⁹⁰ Ballistic missiles can provide speed and surprise in an attack with BW; these aspects limit the ability to deter effectively. Over 40 nations possess intermediate range ballistic missiles.⁹¹ Even the inaccurate SCUD missile is ominous if mounted with a biological warhead for an area or city-sized target.⁹² Motivation for missile proliferation spans perceived needs for prestige, deterrence, autonomy, or warfighting capability.⁹³

Sale and transfer of long range missile systems and their supporting technology complicate regional stability.⁹⁴ North Korea, Iraq, Libya, Iran, and Syria are known to be developing missile and CBW technology.⁹⁵ North Korea's development of its Taepo-dong missile with expected ranges of at least 3500 kilometers is especially alarming.⁹⁶ Use of ballistic missiles in recent conflicts demonstrates a growing willingness of nations to accept the risk of this type of warfare.⁹⁷

The cruise missile threat may be an even greater danger than ballistic missiles. Launch and flight pattern capabilities of these precision munitions make detection very difficult.⁹⁸ Effective defensive measures are questionable.⁹⁹ Supporting technologies are becoming cheaper and easier to obtain on the commercial market.¹⁰⁰ Combined with emerging industrial and biotechnology capabilities to produce BW agents, cruise missiles are an easily available, low-cost means to accurately deliver WMD. Targets may include animal stock yards or agricultural areas, transportation centers, communication nodes, refinery complexes, power production plants, or military concentrations.¹⁰¹

Fear of BW may cause psychological casualties in their own right. Effective counters to this anxiety are selective and visible protective measures, timely and accurate information about BW attacks, effective treatment of casualties, and informed national leader decisionmaking.¹⁰²

V. U.S. LEADERSHIP IN BIOLOGICAL WEAPONS DISARMAMENT

U.S. Leadership in WMD: Apocalypse or Apocrypha?

*One of our most urgent priorities must be attacking the proliferation of weapons of mass destruction whether they are nuclear, chemical, or biological, and the ballistic missiles that can rain down on populations hundreds of miles away...*¹⁰³

The President of the United States

As a world power, the U.S. has a fundamental objective of ensuring a safer world for the present and future. The U.S. uses diplomacy whenever it can, but will use force if the situation demands this resolve.¹⁰⁴ The U.S. demonstrates the commitment to sanction rogue nations and state-sponsors of terrorism, punish specific acts of terrorism, and refuse any negotiations or concessions with terrorists.¹⁰⁵ The U.S. seeks to prevent additional nations from acquiring BW and the means to deliver them.

Politically, the Biological Weapons Convention (BWC) is a central commitment toward disarmament, but does not have an effective means to ensure compliance of the treaty agreements by member states. Several member states continue to ignore its biological warfare prohibitions, and many nations are not members.¹⁰⁶ Review conferences to the BWC in 1980, 1986, and 1991 sought to strengthen its proliferation dissuasion or deterrence of BW. The 1991 conference mandated an Ad Hoc Group of Governmental Experts to recommend confidence building measures to reduce ambiguities between nations, and enhance verifiable compliance of BWC prohibitions. Also known as Verification Experts (VEREX), they recognized that several measures in combination would have the greatest likelihood of success.¹⁰⁷

The U.S. opposes adding more restrictive, intrusive measures to the BWC if verification protocols are ineffective. The facade could create a false sense of security and disrupt legitimate

national defensive and biotechnology activities.¹⁰⁸ If reliability, cost proponency, and the intrusive nature of these measures are resolved, governments and commercial industries will remain concerned about protection of their sensitive and proprietary information.¹⁰⁹ The U.S. President announced that the United States will promote new confidence building measures to increase this transparency with verifiable compliance. A draft protocol may be ready for consideration at the fourth Review Conference of the BWC in 1996.¹¹⁰

Economically, the U.S. expands export controls on specialized equipment, materials, microorganisms, toxins, and technology that could be used for biological weapons.¹¹¹ The U.S. participates in multilateral BW export controls through membership in organizations such as the Australia Group. This group of almost 30 states attempts to control exports of dual-use chemical and biological materials which can be used in the manufacture of chemical or biological weapons.¹¹² They are sensitive to policies and actions which might affect unbalanced industrial competition,¹¹³ and honor export license denials of other member states.¹¹⁴ Unfortunately, these acts have marginal effect on non-member states.

The Missile Technology Control Regime (MTCR) is one of several international forums to engage a global missile nonproliferation norm. The intention is to gain and encourage members to endorse nonproliferation standards, enforce effective export controls, and abandon any offensive ballistic missile programs.¹¹⁵

Militarily, U.S. armed forces may be required to prevent or react to BW. Their use may open a window of opportunity for diplomacy to progress.¹¹⁶ Several biological defensive programs exemplify the integrated efforts to protect U.S. national security, its armed forces, and general citizenry.

The U.S. Biological Defense Research Program (BDRP) develops countermeasures to biological warfare threats. Its goals are to ensure sustained effectiveness of U.S. armed forces in a BW environment and to deter the use of biological weapons by maintaining a strong defensive posture.¹¹⁷ The U.S. experience from the Persian Gulf War spotlighted several BW defense deficiencies in BW detector effectiveness, protective equipment availability, and specific vaccine availability.¹¹⁸

Creation of the Chemical and Biological Defense Agency in 1992 centralized research, development, and acquisition for all military chemical and nonmedical biological defensive programs such as detection and warning equipment.¹¹⁹ U.S. production of BW vaccines is an ongoing challenge. Pharmaceutical companies are reluctant to produce vaccines for the military without contractual assurances of industrial protection or government insurance.¹²⁰ They are leery of these projects due to governmental funding support issues, the public stigma of association with BW defenses, and current U.S. Food and Drug Administration regulations.¹²¹

The U.S. Army is a premier institution for biological health sciences. Its Medical Research Institute of Infectious Diseases (USAMRIID) is a global scientific resource which collaborates with the World Health Organization (WHO) and the Centers of Disease Control and Prevention (CDC) in diagnosis or treatment of unusual diseases throughout the world. USAMRIID developed vaccines for anthrax and botulism, and other diseases such as tularemia and Q fever.¹²²

The Pentagonal Predicament

The challenges of countering biological weapons are to determine the threats, dissuade and deny their acquisition, deter their use, and finally, defend against attack. The United States must demonstrate its resolve to promote nonproliferation, enforce counterproliferation, and deter

violators who threaten world stability with these weapons.

VI. U.S. CHALLENGES IN THE 21st CENTURY

Determine the Biological Weapon Threat.

Threats to U.S. security and international stability rise primarily from potential or known BW and ballistic missile proliferators, rogue states, and terrorists. Authoritative intelligence and diplomatic skill can leverage unilateral or multilateral action to prevent damage to U.S. interests and regional political structures which promote stability. Dual-use biotechnology and research of educational and scientific institutions, medical facilities, and pharmaceutical industries limit the ability to confirm offensive biological weapons programs. Several initiatives are improving U.S. intelligence capabilities. Improved human intelligence (HUMINT) from the Defense HUMINT Service will provide timely and integrated intelligence to support national leaders.¹²³ Research projects are investigating how technology can best support HUMINT to identify suspicious biological research and development or known biological weapon programs.¹²⁴

Dissuade Biological Weapon Acquisition.

Dissuasion persuades a potential proliferator to avoid a decision to acquire BW or delivery means. International diplomacy can undermine attempts to proliferate. Publicizing suspicious biotechnology programs may dissuade particular nations from pursuing BW capability. Regional security alliances, multilateral forums, and economic sanctions can curtail aggressive behavior and make BW financially prohibitive. Confidence building measures (CBM) with verifiable compliance of prohibitions must be the standard.¹²⁵

A U.S. Congressional inquiry on chemical and biological weapons noted:

The chemical and biological threat has increased in terms of widespread proliferation, technical diversity, and probability of use.

The threat is now truly global (rather than bipolar) proliferation; technological developments have broadened the spectrum and increased the diversity of potential chemical and biological weapons; and the volatility of the world political environment has probably lowered the threshold and increased the potential for use of these weapons.

Results must be visible, believable, and relevant to the United States public. A new public consensus will sustain our timely engagement abroad.¹²⁶ Over 80 institutions of the U.S. government cooperate to enforce U.S. policy and export control laws aimed at discouraging biological weapons proliferation.¹²⁷ For example, the U.S. Arms Control and Disarmament Agency (ACDA) provides clear and technically competent insight to the American people concerning nonproliferation and counterproliferation issues.¹²⁸

Deter Biological Weapon Use.

When persuasion does not preclude proliferation, the U.S. will prevent the use of WMD within the jurisdiction of national and international law. This may involve cooperative domestic and foreign investigation and enforcement through agencies such as the Commerce Department's Office of Export Licensing or the Federal Bureau of Investigation. The Commerce Department might refer information to the Central Intelligence Agency's Non-Proliferation Center (NPC) while investigating suspected violations to foreign destinations.¹²⁹

The effort to combat proliferation requires more than a diplomatic and intelligence dialog. U.S. law enforcement services and intelligence agencies may often operate in cooperation with friendly governments and intelligence services. Combined military forces may be directed to conduct specific operations to regulate the security of collective major or vital interests.¹³⁰

Deny Biological Weapon Acquisition or Use.

Specific occasions may warrant preemptive action to protect U.S. national security. The

U.S. will act in cooperation with other endangered nations when appropriate, but will act alone if required. This force may include several means of authorized covert action or other forms of military power projection. Measures short of war are the preferred means. This may capitalize on the particular capabilities of special operations forces (SOF).¹³¹

They enhance U.S. armed forces, non-Department of Defense (DoD) agencies, and international organizations to deter and enforce policies before normal actions by conventional forces can have effect.¹³² SOF can dissuade or delay acquisition or employment of BW, interdict shipments of dangerous materiel and technology, conduct precision strikes to capture or destroy BW, and support other efforts.¹³³

Defend Against Biological Weapon Attack.

The United States must maintain trained and ready armed forces to repel any attack on national security interests. The U. S. must ensure a coordinated interagency counterproliferation effort at federal and state levels of government, and between the state and federal levels. Federal entities include the Departments of State, Defense, Treasury, and Commerce; ACDA, FBI, CIA, NPC, CDC, USAMRIID, the Federal Emergency Management Agency, and armed forces. When employing U.S. military forces, the guiding principle is to use decisive overwhelming force to achieve the assigned protective mission at least cost to U.S. lives.¹³⁴

VII. A U.S. STRATEGY OF ENGAGEMENT AND DISARMAMENT

The U.S. President has stated his concern over the proliferation of weapons of mass destruction as the world approaches the advent of the 21st Century.¹³⁵ Intelligence assessments indicate that BW is a significant danger in many regions of the world.¹³⁶ The U.S. cannot prevent the chilling specter of BW alone. The Persian Gulf War shows that the most effective controls

and deterrence are multilateral. The BWC and its ongoing international confidence building measures, biological materiel and technology controls of the Australia Group, and missile proliferation prohibitions such as the MTCR demonstrate the growing international consensus to stem the spread of BW.¹³⁷

Enduring Aims of Biological Weapons Engagement and Disarmament:

- **We must enhance *National Intelligence Capabilities*.** Strategic warning of BW is essential to allow timely political intervention. Almost anywhere the U.S. is likely to project forces around the world -- Northeast Asia, the Persian Gulf, the Middle East, and Europe -- states are likely to have WMD.¹³⁸ The U.S. believes that there is a very high probability that aggressors will threaten, wield, or use these weapons in major regional contingencies. Recent trends in terrorism spotlight the BW vulnerability of the United States.

- **We must sustain *National Awareness and Commitment*.** A well-informed United States public will recognize the need for robust nonproliferation and counterproliferation efforts against BW. Allocating resources to these programs will promote stability, prosperity, and national security.¹³⁹ Possible missions include nearly simultaneous regional contingencies, global overseas presence, and numerous domestic and foreign operations. These may confront biological weapons and stress the capacities of finite national resources.

- **We must demonstrate *Global Leadership*.** As a world power, the United States prefers to dissuade or deter the BW threat. Countering BW proliferation of other nations and precluding potential regional arms races are integral elements of the U.S. national security strategy. When nonproliferation fails, arms control and disarmament can reduce the risk of crisis. The U.S. demonstrates its sustained willingness to participate in bilateral, trilateral, or multilateral

forums, and actively promote regional arms control.¹⁴⁰

- **We must maintain *Scientific and Technological Superiority*.** The United States requires technological superiority to any potential or present BW adversary. This commitment must optimize the intellectual capabilities of educational and scientific investigation; intelligence collection, analysis, and application; medical research, discovery, and treatment; comprehensive military power projection; and defenses ready to succeed in future crises.¹⁴¹

- **We must apply *Discriminate Military Defensive Capabilities*.** The U.S. requires a decisive military force with definitive superiority over any enemy to clearly reduce national security risks, and swiftly terminate conflicts with minimum loss of life and national resources. Active and passive defensive measures are critical components of countering BW.¹⁴² Specific capabilities may be required to seize, disable, or destroy BW arsenals and their delivery means prior to their use. Effective missile defenses increase the ability of the U.S. to protect its interests. Other measures include effective BW immunization programs, timely battlefield detection of impending or present BW attack, and individual-collective BW protection and decontamination.¹⁴³

VIII. CONCLUSION

Principles for Biological Weapons Engagement and Disarmament

The President and Congress of the United States must concentrate the resolve and resources of the nation to prevent proliferation of biological weapons. This potentially catastrophic issue is more difficult than ongoing nuclear and chemical weapon reduction efforts. The President must lead biological weapon engagement and disarmament with a long-term executive vision, clear set of counterproliferation priorities, and policy guidelines. He must

mobilize the national will. The Congress will reflect this public support by confirming or rejecting the president's priorities and programs. Congressional legislative leadership, oversight, and monetary resourcing are essential to focus the public will, scientific talent, and technological skill of the nation. This strengthens collective U.S. and foreign education, science, medical care, industry, and government initiatives toward a more safe and secure world.

Gateways to Confidence and Compliance

*I believe that one of our greatest challenges as a nation...will be to prevent the proliferation of weapons of mass destruction and the building of massive armaments in the hands of people who are prepared to use them -- not just nuclear, but biological and chemical.*¹⁴⁴

The President of the United States

The United States is encountering a new era of unusual and extraordinary threats. Clear and present dangers of several years ago have rapidly multiplied to many nations with the will and means to use WMD. Today, the most dangerous WMD threat to the national security of the United States may very likely be BW. Terrorism may well be the vector of dissemination.

Engage and Disarm. The United States is intent on marshalling the full resources of the national will -- political, diplomatic, economic, and military -- in order to promote a world safe from the specter of biological weapons. The President sustains a comprehensive policy to combat proliferation of biological warfare and the means to deliver them. The U.S. strives to improve defensive capabilities which deter use of these mass casualty producing weapons, and if used by an adversary, protect the nation and its people from their effects.¹⁴⁵

As a world power, the United States has a moral responsibility. The immediate and long-term goal of the United States is to reduce the threat and use of biological weapons through

effective international control initiatives. Engagement and disarmament maximize the ability of the United States to reinforce an international consensus of BW nonproliferation and counterproliferation.

The global challenges are to dissuade and deny potential proliferators from acquiring these cruel and devastating weapons, deter them from employing biological warfare, reduce regional and world vulnerability to these wanton instruments, and as necessary, defend the United States national security interests. When collective political, diplomatic, and economic efforts fail and U.S. national security interests are endangered, the United States will be compelled to respond unilaterally or in concert with other nations.

The future is not totally predictable or controllable. Nations and their leaders view biological weapons and technology in the context of culture, national interests, and aspirations.

*...biological weapons are a poor man's atomic [bomb] and can be easily produced. We should at least consider them for our defense...Although the use of such weapons is inhumane, the [Iran-Iraq] war taught us that international laws are only drops of ink on paper.*¹⁴⁶

The President of Iran

The question is, *"How will the United States act to counter the threat of biological weapons to U.S. national security interests?"*

Increase in Biological Weapon Proliferation

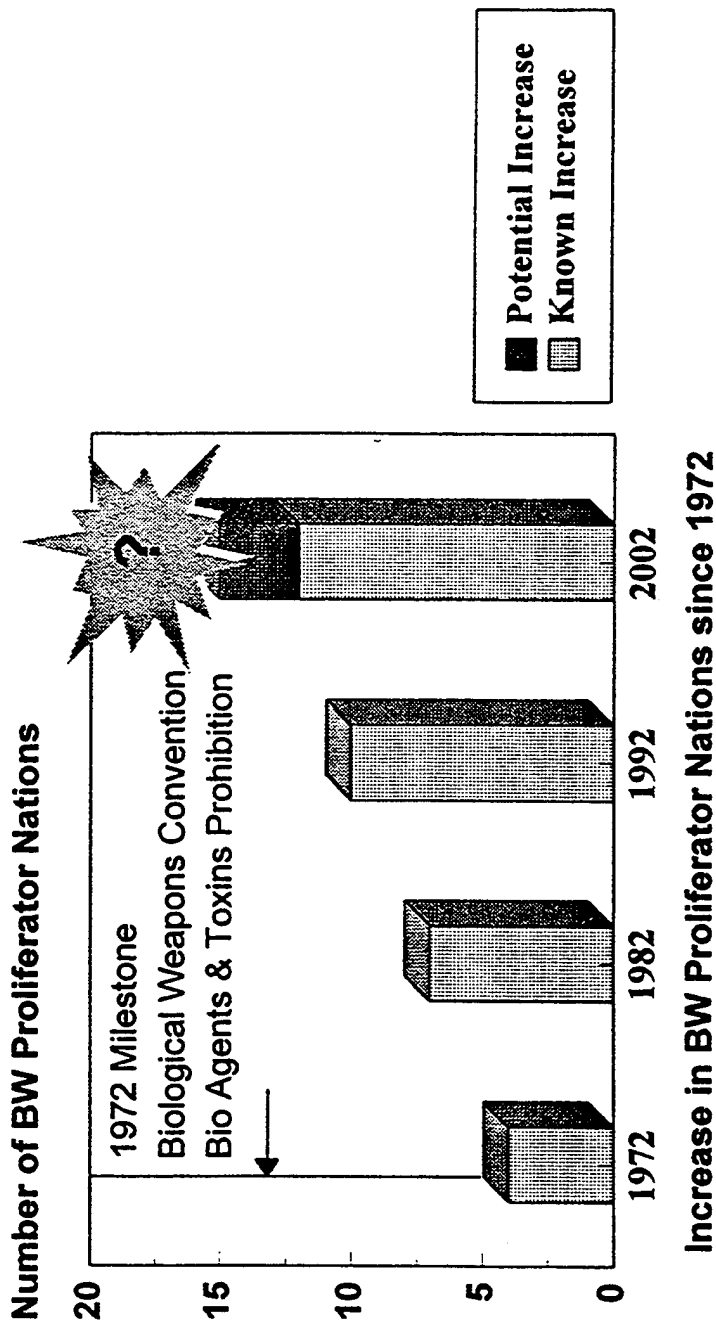


Figure 1. The increase in biological weapons proliferation.

Since the introduction of the Biological Weapons Convention (BWC) in 1972, the number of biological weapon proliferators has risen from four to at least ten nations. The number of proliferator nations appears to be increasing. Periodic Review Conferences (RC) to the Biological Weapons Convention attempt to dissuade the proliferation of biological weapons.

Sources: U.S. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, 1992, 2 and 16.; and U.S. Army Medical Research Institute of Infectious Diseases, U.S. Army Medical research Institute of Infectious Diseases, 1994, 3.

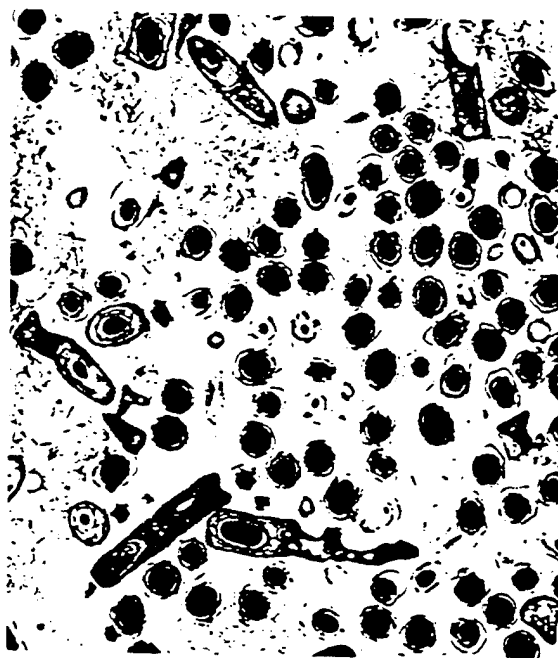


Figure 2. *Bacillus anthracis* free spores.

Source: U.S. Army Medical Institute of Infectious Diseases, 1995.



Figure 3. Ebola-Reston virions recovered from a supernatant of cultured cells.

Source: U.S. Army Medical Institute of Infectious Diseases, 1994.

A Representative Specter of Known or Potential Biological Weapon Proliferators

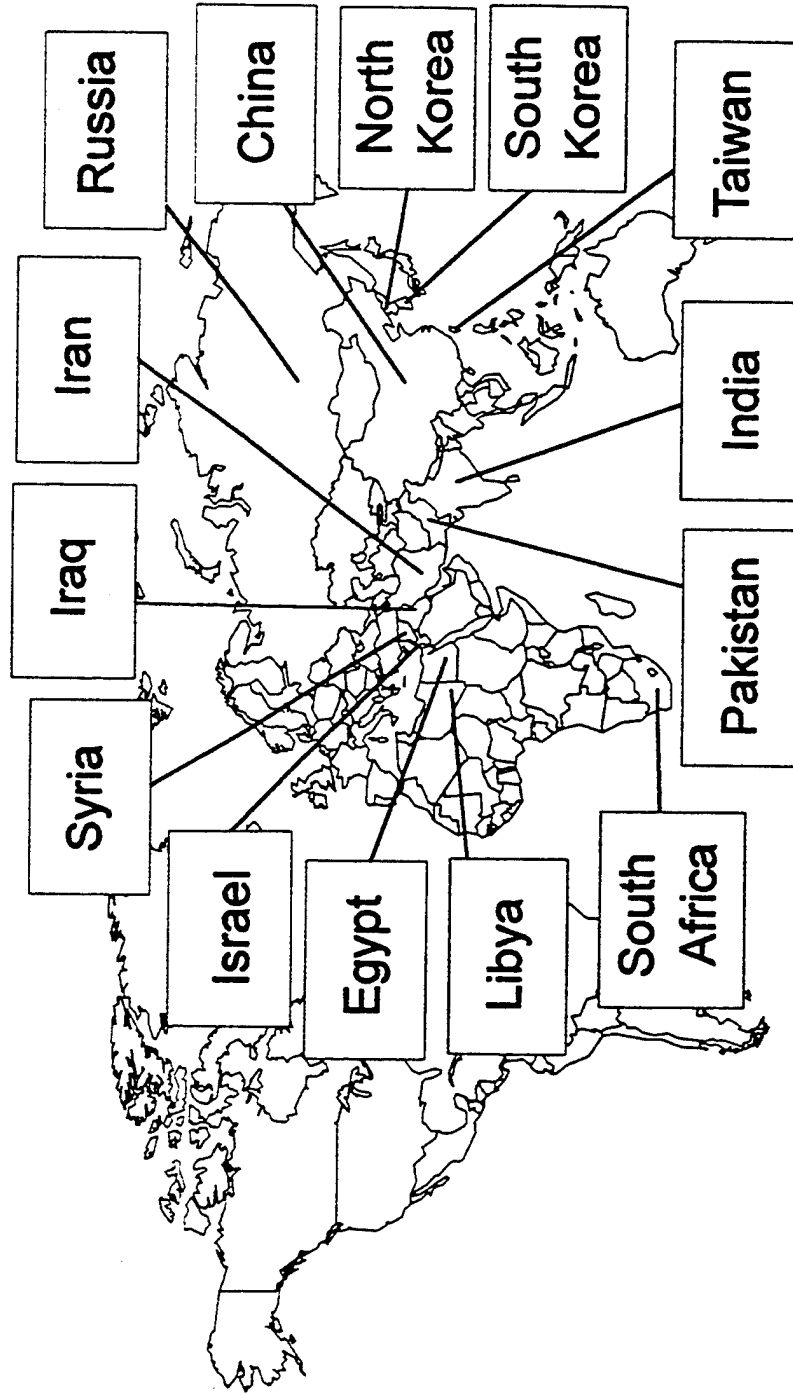


Figure 4. BW Proliferators: A Representative Specter of Known or Potential Biological Weapon Proliferators. Sources include official and unofficial estimates of known or potential biological weapon proliferators.

Sources: U.S. Arms Control and Disarmament Agency, Adherence To and Compliance With Arms Control Agreements, 1994, 11-12; W. Seth Carus, "The Poor Man's Atomic Bomb?" Biological Weapons in the Middle East, 1991, 23-29; and John S. McCain III, "Proliferation in the 1990s: Implications for U.S. Policy and Force Planning," Strategic Review, 1989, 11, 14 and 15.

ENDNOTES

1. Arms Control and Disarmament Agency, ACDA Annual Report to Congress: 1993, (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1994), 17.
2. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, (Washington, D.C.: U.S. General Accounting Office, 1992), 16. Also, see Carus, in his pamphlet "The Poor Man's Atomic Bomb?" Biological Weapons in the Middle East, pages 24, 25, and 34. He cites U.S. governmental public statements of at least eight countries thought to be involved in BW related activities: the Soviet Union [now Russia], Peoples Republic of China (PRC), Iran, Democratic Peoples Republic of Korea (North Korea), Libya, Syria, and Republic of China (Taiwan). Other unofficial sources claim Israel has a BW program. He cites a 1972 quote of Egypt's President Sadat with Egypt's possession of "instruments of biological warfare."
3. Army Medical Research Institute of Infectious Disease, "USAMRIID and the Biological Weapons Convention (BWC)," U.S. Army Medical Research Institute of Infectious Diseases, 1, no. 1, (October 1994): 3.
4. William J. Perry, Annual Report to the President and the Congress, Report of the Secretary of Defense to the President of the United States and Congress. (Washington, D.C.: U.S. Department of Defense, 1995), 25.
5. Togo D. West, Jr. and Gordon R. Sullivan, The United States Army Modernization Plan: Update (FY95-99), (Washington, D.C.: U.S. Department of the Army, 1994), 13-2.
6. U.S. President. Public Papers of the Presidents of the United States Book I - January 1, 1991 to June 30, 1991, (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1991) George Bush, 1991, 707. President Bush summarized his message to Congress reporting on "The National Emergency with Respect to Chemical and Biological Weapons Proliferation" dated 21 June 1991. He stated, "The proliferation of chemical and biological weapons continues to constitute an unusual and extraordinary threat to the national security and foreign policy of the United States." This presidential executive order imposes export controls on goods, technology, and services that can contribute to the proliferation of chemical and biological weapons and delivery systems. Validated exporter licenses are a primary control means. The order also directs sanctions against foreign persons or countries involved in chemical and biological proliferation activities under specified circumstances.

7. Pamela Pohling-Brown, "Technologies for America's New Course," International Defense Review, 10, no. 27 (October 1994): 33 and 38. Also, see the 1994 "Report on Nonproliferation and Counterproliferation Activities and Programs" from the Office of the U.S. Deputy Secretary of Defense. It details a U.S. interagency review of non- and counterproliferation issues. In U.S. government, over 80 different groups contribute to this effort. Several of the more notable are: the Departments of Energy, Defense, Treasury, State, and Commerce; research laboratories and test centers, the Nonproliferation Center (NPC), and the Arms Control and Disarmament Agency (ACDA).

8. Perry, iii and 1.

9. Ibid., 17.

10. Department of the Army, Military Biology and Biological Warfare Agents, Technical Manual 3-216 (Washington, D.C.: U.S. Department of the Army, 11 January 1956), 2 - 4.

11. George M. Merck, "Biological Warfare," The Military Surgeon: Journal of the Association of Military Surgeons of the United States, 98 (January-June 1946): 237-242. In 1942, President Roosevelt established a civilian agency to investigate defensive requirements of biological warfare. This effort eventually transferred to the U.S. Army's Chemical Warfare Service and cooperated in a combined wartime program with the United Kingdom and Canada. Also, see Harris and Paxman, A Higher Form of Killing, (p.163). Roosevelt stated that the U.S. would never use BW except in retaliation. Deterrence through adequate defenses and responsive capabilities were the achieved objectives. A complementary value of many projects was the major advances in diagnosing, treating, and preventing certain infectious diseases in humans and animals, as well as control of certain diseases of plants.

12. Robert Harris and Jeremy Paxman, A Higher Form of Killing, (New York: Hill and Wang, 1982), 85. Germany's World War II BW program was far less advanced than the Allies estimated. There is evidence of German research in antianimal and anticrop methods by late in the war and antipersonal experiments in several concentration camps, but no evidence exists of any weaponization.

13. Barton J. Bernstein, "Churchill's secret biological weapons," Bulletin of the Atomic Scientists, 43, no. 1 (January-February 1987): 46-50. Concern about BW defense for the United Kingdom was real in the years preceding World War II. Early British experiments with anthrax on the island of Gruinard off the Scottish coast left the area with long-term contamination. Eventually, as concern grew to the potential offensive use of other BW agents such as *botulinus* toxin by Germany, the U.S. and the United Kingdom shared information and programs on

biological warfare defensive techniques as well as the ability to retaliate in kind. These included a major distribution of botulin antidote to the United Kingdom from Canada and a covert information campaign to ensure that the Germans knew of Allied defensive measures. An offensively oriented program produced small bombs that could disperse anthrax for anti-personnel or anti-animal purposes. Fortunately, Germany had neither an offensive BW program nor any BW munitions in development in World War II. Also, see Harris and Paxman in their book A Higher Form of Killing, page 74. They note German biological sabotage in World War I with use of glanders in horses and mules, anthrax in cattle, and alleged plague in Russia.

14. Robert Gomer, John W. Powell, and Bert V. A. Rolling, "Japan's biological weapons: 1930-1945 a hidden chapter in history," The Bulletin of the Atomic Scientists, 37, no. 8 (October 1981): 43-52. The authors recount heinous acts of BW by Japan in areas of occupied and contested China from 1931 to 1945. Estimates claim several thousand people died in BW experimental stations from a variety of agents: anthrax, botulism, brucellosis, hemorrhagic fever, tick encephalitis, tularemia, glanders, smallpox, cholera, typhoid, typhus, dysenteries, and plague. Some victims were subjected to vivisection or murdered to study sequential BW debilitation. Several hundred people probably died from Japanese operations that disseminated plague in civilian population centers. Also, see "'Japan's Biological Weapons: 1930-1945' - an update," The Bulletin of the Atomic Scientist, 38, no. 8 (October 1982): 62. In 1982, the Japanese government acknowledged the extensive Japanese bacteriological and other experiments on human subjects in occupied China. Japan's State Minister Kunio Tanabe stated that the experiments occurred "during the most extraordinary wartime conditions" and "were most regrettable from the viewpoint of humanity."

15. John Hemsley, The Soviet Biochemical Threat to NATO, (London: The MacMillan Press Ltd, 1987), 11 and 23.

16. Harris and Paxman, 143-145.

17. Cecil H. Coggins, "Weapons of Mass Destruction," Military Review, XLIII, no. 6 (June 1963): 48-49.

18. W. Seth Carus, "The Poor Man's Atomic Bomb?" Biological Weapons in the Middle East: Policy Papers Number 23, (Washington, D.C.: The Washington Institute for Near East Policy, 1991), 62 - 63. Also, see Hersh's book Chemical and Biological Warfare, pages 71 and 72. He notes U.S. drone research in 1960 which eventually could carry up to 200 pounds of chemical or biological agent. A 1964 U.S. Army field manual described typical biological missile system functions. By 1967, technical reports described data on a biological warhead program for the Sergeant missile. [This missile has a range of about 75 miles.]

19. Coggins, 43-50. Dr. Coggins, former Chief of Atomic, Biological, and Chemical Warfare for the U.S. Navy, states his concern that more attention be focused on biological and chemical weapons of the Soviet arsenal as well as the more obvious nuclear weapons. He states that the Soviets had been doing research in BW five years longer than the U.S. and recognized the devastating potential for casualty effects which BW could cause as one of the three WMD.
20. Walter J. Stoessel, "The Reagan Administration's Biological Warfare Policy," Preventing a Biological Arms Race, ed. Susan Wright, (Cambridge: The MIT Press, 1990), 428. Douglas J. Feith, Deputy Assistant Secretary of Defense for Negotiations Policy, characterized the Soviet BW program in testimony before the Subcommittee on Oversight and Evaluation of the U.S. House of Representatives Permanent Select Committee on Intelligence, 8 August 1986. Also, see Manfred R. Hamm, "Biochemical Warfare: Deterrence vs. Arms Control," Contemporary Review, 246, no. 1430 (March 1985): 129. Almost any weapon system in their arsenal could deliver biochemical agents: artillery over 100 millimeter, mobile rocket launchers, or helicopters and jets with special equipment. Eventually, surface to surface missiles such as FROG, SCUD, or SS-21s and SS-23s could deliver BW warheads.
21. Carus, 33-34. Carus states several possible causal factors for this unilateral U.S. disarmament: its nuclear arsenal was a security guarantor without need of BW, its nuclear arsenal was a sufficient deterrent and retaliatory capability against BW, and several unpredictable or unreliable features of BW reduced its practical military advantages.
22. Edward J. Lacey, "Official Text: Acting Assistant Director, Bureau of Verification and Implementation, U. S. Arms Control and Disarmament Agency, to the Fall meeting of the Biological and Biotechnology Section of the Pharmaceutical Manufacturers Association, Baltimore, Maryland, 29 September 1992," Chemical and Biological Weapons Reader (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1994), 123-129.
23. Susan Wright, ed., "Text of the 1972 Biological Weapons Convention," Preventing the Biological Arms Race, (Cambridge: The MIT Press, 1990), 370. The formal title of the 1972 Biological Weapons Convention treaty is "Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction (Biological Weapons Convention) (BWC)." It is a principle means of seeking universal prohibition of weaponizing biological type agents and toxins. The parties to the BWC agree not to develop, produce, stockpile, or acquire biological agents or toxins of types and in

quantities that have no justification for prophylactic, protective, and other peaceful purposes, as well as related weapons and means of delivery.

24. Arms Control and Disarmament Agency, "Fact Sheet: A Chronology of Arms Control and Related Treaties and Agreements Including Confidence and Security Building Measures, and Measures Related to Non-Proliferation, Transparency, and Defense Conversion," Chemical and Biological Weapons Reader, (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1994), 134.

25. Arms Control and Disarmament Agency, Annual Report to Congress 1992, (Washington, D.C.: U. S. Arms Control and Disarmament Agency, 1993), 83.

26. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, (Washington, D.C.: U.S. General Accounting Office, 1992), 10. In 1975, the U.S. entered into force the Geneva Protocol in conjunction with the BWC.

27. Milton Leitenberg, "Anthrax in Sverdlovsk: New Pieces to the Puzzle," Arms Control Today, 22, no. 3 (April 1992): 10-13. After a cooperative study effort by Russian and American scientists, the conclusion is that an anthrax aerosol was accidentally released from a biological research facility in Sverdlovsk on April 2, 1979. U.S. estimates are 200 to 300 people died in the accident. According to an article "Deaths in 1979 Tied to Soviet Military," in the 18 November 1994 New York Times, (sec A, p.10) at least 96 people were infected and 66 people died.

28. Charles Piler and Keith R. Yamamoto, Gene Wars, (New York: Beech Tree Books - William Morrow and Company, Inc., 1988), 65-69. The authors cite at least 10 allegations of biological and toxin attacks throughout the world between 1969 - 1986. Attacks include antipersonal, antianimal, and anticrop warfare.

29. Department of the Army, " U.S. Army Medical Research Institute of Infectious Diseases 1969-1994, (Fort Detrick, MD: U.S. Army Medical Research Institute of Infectious Diseases, 1994), 16.

30. Department of Defense, Conduct of the Persian Gulf War, (Washington, D.C.: U. S. Department of Defense, 1992), 14-16, 97, 640. This final report to Congress on conduct of the Persian Gulf War cited the potential lethality of biological weapons with this illustration: "A Scud missile warhead filled with botulinum could contaminate an area of 3,700 square kilometers

(based on ideal weather conditions and an effective dispersal mechanism), or 16 times greater than the same warhead filled with Sarin. By the time symptoms occur, treatment has little chance of success. Rapid field detection methods for biological warfare agents do not exist." Characteristics of Iraqi SCUD missile variants span ranges from a launch point of 300 to 750 kilometers. From Iraq, these arcs encompass Israel, Syria, Jordan, Lebanon, Kuwait, as well as parts of Turkey, Iran, and Saudi Arabia. The threat was real. Large scale Iraqi production of BW agents began in 1989 at four facilities near Baghdad. Available delivery means ranged from simple aerial bombs, artillery shells, rockets, and aircraft-mounted spray tanks to surface-to-surface missiles. Although Iraqi variants of SCUD missiles were inaccurate for any precision targeting, such arsenals, if outfitted with biological weapons would have posed a genuine "strategic" threat to U.S. interests and other regional nations

31. U.S. President. Public Papers of the Presidents of the United States (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1991) George Bush, 1991, 37. The following statement is an excerpt from President Bush's letter to President Saddam Hussein of Iraq dated 5 January 1991: "Let me state, too, that the United States will not tolerate the use of chemical or biological weapons or the destruction of Kuwait's oil fields and installations. Further, you will be held directly responsible for terrorist actions against any member of the coalition. The American people would demand the strongest possible response. You and your country will pay a terrible price if you order unconscionable acts of this sort."

32. Jeff Leeds, "Data Sought on Toxic Attacks in the Gulf War," Los Angeles Times, 26 May 1994, 4. U.S. Secretary of Defense William J. Perry and General John M. Shalikashvili, Chairman of the U.S. Joint Chiefs of Staff, stated, "There is no information, classified or unclassified, that indicates that chemical or biological weapons were used in the Persian Gulf [War]."

33. U.S. President, Public Papers of the Presidents of the United States, Book I - January 20 to July 31, 1993, (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1993), William J. Clinton, 1993, 1166. President Clinton reported to the U.S. Congress on Iraq's lack of compliance with UN Security Council resolutions. "Iraq depicts itself as seeking consultations, rather than confrontation, in complying with Security Council resolutions. Iraq, however, has attempted to obstruct even the clearest Security Council requirements." For example, Iraq refused to divulge required information on prohibited programs, attempted to restrict UN aerial inspection rights, and in general, antagonized a hostile environment.

34. "28 June," Chemical Weapons Convention Bulletin, September 1994, 25. Newspapers around the world noted the 1994 sarin nerve gas attack in Matsumoto, Japan which caused seven deaths and over 200 casualties.

35. David Van Biema, "Prophet of Poison," Time, 3 April 1995, 26 -33. Unidentified persons, alleged to be members of a religious cult, murdered at least 10 people and injured thousands by releasing several containers of sarin nerve agent in the Tokyo subway system.

36. Bruce Hoffman, The World Trade Center Bombing, The Three Mile Island Intrusion and the Potential Threat to U.S. Nuclear Power Plants, Testimony before the U.S. Senate Committee on Environment and Public Works, Subcommittee on Clean Air and Nuclear Regulation, 19 March 1993, 9. Six persons were killed and over one thousand persons were injured in the 1993 World Trade Center bombing. Hoffman notes that this was the first terrorist incident in the U.S. since 1986 to kill anyone, and except for the 1975 New York City LaGuardia Airport bomb explosion which killed 11 persons and injured 75 others, no other U.S. domestic terrorist incident has killed more people. [Since publication of this source, the bombing of the Federal Building in Oklahoma City tragically surpasses the number of murdered and wounded U.S. civilians.]

37. Robert H. Kupperman, "United States Becoming Target for Terror Forays," National Defense, LXXIX, no. 504 (January 1995): 22 -23. Essential utilities may be the emerging target of terrorists. This may include technological infrastructure; computer information systems; telecommunication networks; electric, gas, or oil facilities; transportation networks; or potable water supplies. Any of these can gain free media attention in order to promote terrorist agendas.

38. "Bombing Kills Dozens in Federal Building," The Washington Post, 20 April 1995, sec. A, p. 1.

39. Hoffman, 13. Hoffman states that since 1968, the United States has been the country most frequently attacked by terrorists. Other countries which follow the U.S. on this annual tally of terrorist attacks are: Israel, France, Great Britain, West Germany, the Soviet Union, Turkey, Cuba, Spain, and Iran.

40. "Topicwatch: A New Type of Terror," The (Harrisburg, PA) Patriot-News, 9 April 1995, sec. A1, p.2. The article cites a The Los Angeles Times article which quotes the acting Director of the U.S. Central Intelligence Agency on terrorist objectives and methodology.

41. Albert E. Snell and Edward J. Keusenkothen, "Mass Destruction Weapons Enter Arsenal of Terrorists," National Defense, LXXIX, no. 504 (January 1995): 20-21. The U.S. State Department reports that 61.4% of worldwide terrorist attacks in 1993 were directed at "business." This significant increase compares with business targets being 44% of the recorded acts only two

years earlier.

42. Conduct of the Persian Gulf War, 15.

43. Elliott Hurwitz, "Terrorists and Chemical/Biological Weapons," Naval War College Review XXXV, no. 3 (May-June 1982): 36-40.

44. Hoffman, 5, 7 and 8. Hoffman states that although terrorists have rarely attempted mass, indiscriminate casualties, religious or ethnic fanaticism could damper psychological barriers to such acts of mass murder. Use of a chemical, biological, or nuclear weapon could become a viable option.

45. Erhard Geissler, "Biological weapon and arms control developments," in SIPRI Yearbook 1994, 25th ed., Connie Wall, Billie Bielckus, Jetta Gilligan Borg, Eve Johansson, and Don Odom, eds. (New York: Oxford University Press Inc., 1994), 719. He cites the statement of a former senior official in the KGB. The toxin ricin was injected into a dissident by order of the Bulgarian president. The victim died four days after the clandestine attack.

46. Department of the Army, Military Biology and Biological Warfare Agents, Army Technical Manual 3-216, (Washington, D.C.: U.S. Department of the Army, 11 January 1956), 2, 3, and 6. Also, see Arms Control and Disarmament Agency, "Fact Sheet: Biological Weapons Convention: The Special Conference and Beyond," Chemical and Biological Reader, (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1995), 37.

47. David R. Franz, Defense Against Toxin Weapons, (Fort Detrick MD: U.S. Army Medical Research Institute of Infectious Diseases, 1993), 4-6, 22.

48. Marsha F. Goldsmith, "Defensive Biological Warfare Researchers Prepare to Counteract 'Natural' Enemies in Battle, at Home," Medical News & Perspectives, 266, no. 18 (13 November 1991): 2522. Goldsmith cites an interview report of scientists at the U.S. Army's Dugway Proving Grounds.

49. Conduct of the Persian Gulf War, 15.

50. Military Biology and Biological Warfare Agents, Army Technical Manual 3-216, 1956, 44-45.
51. Sharon Begley, John Barry, and Mary Hager, "The Germ Warfare Alert," Newsweek, 7 January 1991, 25.
52. Franz, 13 and 19.
53. Jonathan B. Tucker, "Gene Wars," Foreign Policy no. 57 (Winter 1984-1985): 69.
54. SIPRI Yearbook 1994, 721.
55. "Scientists seek origin of virus that killed both horse, man," The Carlisle (PA) Sentinel, 7 April 1995, sec. A, p. A7.
56. Laurie Garrett, The Coming Plague (New York: Farrar, Straus, and Giroux, 1994), 426 - 427.
57. Ibid., 157.
58. Ibid., 189 and 614.
59. John Maurice, "Russian Chaos Breeds Diphtheria Outbreak," Science, 267, no. 5203, 10 March 1995, 1416-1417.
60. SIPRI Yearbook 1994, 720-721. A suspicious outbreak of anthrax occurred during the 1979-1980 civil war in Zimbabwe. The outbreak affected thousands and caused numerous deaths. Participants alleged use of anthrax, cholera, and chemical agents during the conflict
61. Defense Intelligence Agency, Soviet Biological Warfare Threat, (Washington, D.C.: U.S. Defense Intelligence Agency, 1986), 3, 10 and 14.
62. Soviet Biological Warfare Threat, 3 and 14.

63. Joseph D. Douglass, Jr., "The Expanding Threat of Chemical-Biological Warfare: A Case of U.S. Tunnel Vision," Strategic Review, XIV, no. 4 (Fall 1986): 41.
64. Ibid., 42. Soviet military exercises and literature in the 1970s and 1980s promoted the capabilities of using CBW agents to incapacitate opposing forces or populations. A 1982 U.S. Department of State report of Soviet actions in Afghanistan discussed the use of fast-acting incapacitants.
65. Joseph D. Douglass, Jr. and H. Richard Lukens, "The Expanding Arena of Chemical - Biological Warfare," Strategic Review, XII, no. 4 (Fall 1984): 76-77.
66. U.S. Army Medical Research Institute of Infectious Diseases 1969-1994, 9-10.
67. Franz, 26-27.
68. Franz, 3 and 44.
69. Joseph D. Douglass, Jr., "Who's Holding the Psychotoxins and DNA-Altering Compounds?" Armed Forces Journal International, 130, no. 2 (September 1992), 52. Douglass notes the organism responsible for Legionaire's Disease as able to live and reproduce in chlorinated water. Also, see Garrett in her book The Coming Plague, pages 189, 429, and 430. She describes *Legionella* bacterium and a parasitic organism, *Cryptosporidium*, as capable of surviving in chlorinated water.
70. Arms Control Association, Arms Control and National Security: An Introduction, (Washington, D.C.: Arms Control Association, 1989), 129.
71. Jeff Erlich and Pat Cooper, "Biological weapons put world on edge," Army Times, 10 April, 1995, 26. Erlich and Cooper cite a 1993 study by the congressional Office of Technology Assessment that a modeled anthrax attack on a city could kill 100,000 people. An accompanying map presentation notes a modeled contamination of 10 square kilometers with 30 kilograms of anthrax spores; the casualty estimate is 30,000 to 100,000 deaths. Also, see Carus in his pamphlet The Poor Man's Atomic Bomb? Biological Weapons in the Middle East, page 38. He cites a World Health Organization estimate of a postulated attack using 50 kilograms of anthrax against a city of one million people in a developing country. The attack could kill 95,000 people.

72. Ibid., 46.
73. Leitenberg, 11. The author describes a massive decontamination effort after the anthrax accident at Sverdlovsk in 1979. Some significant measures were removing topsoil from the area, and spraying houses, rooftops, and machinery in the vicinity of the biological facility. BW agents such as anthrax produce long-term contamination. Debilitating effects on the human population in any of these areas, sparsely or densely populated, is certain.
74. Franz, 39-40.
75. Ibid., 32-33. Also, see Sharon Begley, John Barry, and Mary Hager, "The Germ Warfare Alert," Newsweek, 7 January 1991, 25. For example, it takes three doses of anthrax vaccine spread over 29 days to provide immunity. Researchers disagree on how long afterward the body builds up full immunity.
76. SIPRI Yearbook 1994, 716-718.
77. Arms Control and Disarmament Agency, Adherence To and Compliance With Arms Control Agreements, (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1994), 11.
78. SIPRI Yearbook 1994, 723.
79. Adherence To and Compliance With Arms Control Agreements, 1994, 11-12.
80. Paul Beaver, ed., Jane's Sentinel: The Unfair Advantage (The Gulf States), (Surrey, UK: Jane's Information Group, 1994), 15-16. One estimate claims that Iraq could produce BW in 12 weeks.
81. Arms Control: U.S. and International Efforts to Ban Biological Weapons, 55. The Director of Naval Intelligence stated in public hearings before the U.S. House Armed Services Committee on Intelligence Issues that Iraq had developed an offensive biological warfare capability. Also, see Conduct of the Persian Gulf War, 15 and 640.
82. SIPRI Yearbook 1994, 716. The author quotes a 1993 statement by Director of the CIA Woolsey. Also, see U.S. ACDA statement in "Adherence to and Compliance with Arms Control Agreements," 23 June, 1994.

83. "20 September," Chemical Weapons Convention Bulletin, December 1994, 21.
84. Joseph S. Bermudez, "CW: North Korea's growing capabilities..." Jane's Defense Weekly, 11, no. 2 (14 January 1989): 54.
85. Steven S. Walsky and Dr. Paul Schumann, "Artillery, Rockets, and Space," How They Fight: Armies Around the World, (July-November 1991): 29-35.
86. "15 July," Chemical Weapons Convention Bulletin, September 1994, 27. Also, see Greg J. Gerardi and James A. Plotts, "An Annotated Chronology of DPRK Missile Trade and Developments," The Nonproliferation Review, 2, no. 1 (Fall 1994): 66 and 83. The authors state an estimated range capability for the No-dong-1 missile of 1,000 to 1,300 kilometers. They cite U.S. CIA Director James Woolsey, in testimony before Congress, that the No-dong -1 missile could be fitted with nuclear, biological, or chemical (NBC) as well as high explosive (HE) warheads. Furthermore, Woolsey stated, "...with this missile, North Korea could reach Japan; Iran could reach Israel; and Libya could reach U.S. bases and allied capitals in the Mediterranean Region."
87. ACDA Adherence to and Compliance with Arms Control Agreements, 1994, 12.
88. SIPRI Yearbook 1994, 715-716.
89. U.S. President, Public Papers of the Presidents of the United States, Book I - January 20 to July 31, 1993, 1054. For instance, North Korea continues to develop, test, and solicit for export a missile with a range of 600 miles or more. This range threatens Osaka, Japan from launch sites North Korea, and would threaten Tel Aviv, Israel from launch sites in Iran. Also, see Bruce W. Nelan, "Fighting Off Doomsday," Time, 21 June 1993, 36. North Korea reportedly has enough plutonium for at least one nuclear bomb. Their new missile, the No-dong 1, can reach beyond South Korea to areas of Japan, China, and Russia.
90. Perry, 240-241.
91. Joseph F. H. Peterson, "Ballistic Missile Proliferation: A National Security Focus for the 21st Century," Carlisle Barracks, Carlisle, PA: U.S. Army War College Strategic Research Project, 1994, 5.

92. John S. McCain III, "Proliferation in the 1990s: Implications for U.S. policy and Force Planning," Strategic Review XVII, no. 3, (Summer 1989): 16.
93. Peterson, 4-5.
94. U.S. President, Public Papers of the Presidents of the United States, Book I - January 20 to July 31, 1993, 774. In November 1992, China transferred MTCR-class M-11 missiles and related equipment to Pakistan. This violates MTCR commitments and questions China's intent to prevent proliferation of WMD and their means of delivery. Also, see Bruce W. Nelan, "Fighting Off Doomsday," Time, 21 June 1993, 36-38. The Chinese have provided its missile technology to Iran. China can provide advanced missile technology it is getting from Russia and Ukraine to any number of willing recipients.
95. Clifford F. Beal, "Poison Bomb Alert," World Monitor, (September 1990): 62 - 66. Reasons for chemical and biological weapons proliferation vary. They range from mutual suspicions of bellicose bordering states, suspected WMD capability, or a distorted viewpoint of practical research, development, and production costs related to potential power and effects.
96. Les Aspin, "The Defense Counter Proliferation Initiative," Asia-Pacific Defense Forum, 18, no. 4 (Spring 1994): 3 - 4.
97. Army Intelligence and Threat Analysis Center, How They Fight: Armies of the World, (Washington, D.C., U.S. Army Intelligence and Threat Analysis Center, 1994): 77, 79. Syria used surface to surface missiles (SSM) against Israel in 1973. Iraq and Iran used SSMs during their 1980-1988 war. Iraq attacked Israel and Saudi Arabia with SSMs in 1991. Yemeni forces in both the north and south used them during their 1994 civil war. Additionally, the Persian Gulf War demonstrated the dramatic success of cruise missiles and other precision guided munitions.
98. Sandra I. Meadows, "Regional Instability Rips Current Security Notions," National Defense, LXXIX, no. 504 (January 1995): 18-19.
99. Ibid., 19. A U.S. Congressional Office of Technology assessment report noted that of the many delivery systems available, the cruise missile development and testing will be the most difficult to detect. Also, the report notes that producing biological agents is relatively easy and inexpensive for any nation with a modestly sophisticated pharmaceutical industry.

100. Peterson, 8. Peterson cites seven countries with cruise missile programs: Belarus, France, Kazakhstan, Russia, Syria, Ukraine, and the U.S. Several other countries have cruise missile programs in phases of development: Brazil, China, Germany, Iraq, Israel, Italy, Japan, North Korea, Sweden, Taiwan, and the United Kingdom.

101. McCain, 10 and 18. Ballistic and cruise missiles may garner much attention, but another very effective means of BW delivery is long-range offensive aircraft. Modern jet airplanes with air-to-air refueling capability double or triple their potential strike range. In this manner, Libyan Su-24 jets can reach Israel or other potential opponents throughout the Mediterranean region.

102. Franz, 12. For example, from 18 January to 28 February 1991, some 39 Iraqi-modified SCUD missiles reached Israel. Although many were off target or malfunctioned, some of them landed in and around Tel Aviv. Approximately 1,000 people were treated as a result of missile attacks, but only two died. Anxiety was listed as the reason for admitting 544 patients and atropine overdose for hospitalization of 230 patients. Approximately 75% of the casualties resulted from inappropriate actions or reactions on the part of the victims.

103. Aspin, 4. In September 1993, President Clinton addressed the United Nations General Assembly on stemming the proliferation of WMD and ballistic missiles.

104. U.S. President, A National Security Strategy of Engagement and Enlargement, (Washington, D.C.: The White House, 1995), ii.

105. Ibid., 10-11. President Clinton ordered the cruise missile attack on the headquarters of the Iraqi intelligence service after determining that Iraq had plotted an assassination attempt against former President Bush. The U.S. participated in international condemnation and UN Security Council sanctions against Libya for involvement in the Pan American Airlines flight 103 bombing. Similarly, the U.S. obtained convictions against defendants in the World Trade Center bombing.

106. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons (Washington, D.C.: U.S. General Accounting Office, 1992), 14.

107. Arms Control and Disarmament Agency, "Fact Sheet: Biological Weapons Convention: The Special Conference and Beyond," U.S. Arms Control and Disarmament Agency Chemical and Biological Weapons Reader, (Washington, D.C., U.S. Arms Control and Disarmament Agency, 1995), 37-38.

108. Lacey, 125-126.
109. SIPRI Yearbook 1994, 713,728-731.
110. Arms Control and Disarmament Agency, "Fact Sheet: The Biological Weapons Convention: The Special Conference and Beyond," 1995, 37-38 and 47-48. These verification measures encompass activities under three broad areas of biological development, acquisition or production, and stockpiling. On-site actions include exchange visits, inspections, and continuous monitoring. Off-site actions include information monitoring, data exchanges, remote sensing, and inspections. The VEREX recommendations head in a positive direction and will be useful in building confidence through increased transparency of BWC obligations.
111. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, 1992, 5. Examples of equipment are fermenters, centrifugal separators, special filtration devices, or biosafety containment facilities equipment.
112. Arms Control and Disarmament Agency, "Fact Sheet: The Biological Weapons Convention: The Special Conference and Beyond," 1995, 5. Also, for a listing of prohibited BW items sanctioned by the Australia Group, see Arms Control and Disarmament Agency "Fact Sheet: Australia Group Exports Controls on Materials Used in the Manufacture of Chemical and Biological Weapons," U.S. Arms Control and Disarmament Agency Chemical and Biological Weapons Reader, (Washington, D.C.: U.S. Arms Control and Disarmament Agency, 1995), 17-24. The controls list sanctions biological agents, genetically modified microorganisms, and animal and plant pathogens. They also publish a warning list of other possible dual-use items or BW precursors to raise awareness of nations and their industries.
113. Government Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, 1992, 11. The Australia Group has almost 30 member states.
114. Arms Control and Disarmament Agency, Annual Report to Congress 1992, 17.
115. "White House Factsheet on Non-Proliferation and Export Control Policy: Office of the Press Secretary, The White House, September 27, 1993," Arms Control Today, November 1993, 27 - 28.

116. U. S. President, A National Security Strategy of Engagement and Enlargement, 1995, ii.
117. U.S. Army Medical Research Institute of Infectious Diseases 1969-1994, 9.
118. Conduct of the Persian War, 640-1, 643, 645-646. The Iraqi threat in 1990-1991 was clearly established. They had used CW during attacks on unprepared Iranian armed forces in 1984. Iraq had the capability and experience to use chemical warfare, and the capability to use biological warfare; but did not during the Persian Gulf War. Although far from satisfactory in U.S. mission-oriented protective posture, the U.S. did accomplish several fielding initiatives involving developmental and new items which improved the overall CW/BW defense posture.
119. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, 1992, 16. Also, see General Accounting Office, Chemical and Biological Defense: U.S. Forces are Not Adequately Equipped to Detect All Threats, (Washington, D. C.: U. S. General Accounting Office, 1993), 2, and Jeff Erlich and Pat Cooper, 26. In the six years preceding the Persian Gulf War, less than 7% of total chemical and biological research and development funds went to biological agent detection. By 1993, biological detection research accounted for approximately 30% of total chemical and biological detection research and development funding. Currently, DoD is combining the defensive efforts of all armed forces services into joint chemical and biological programs. In 1996, the individual service programs are consolidated into a single \$243 million budget request. This is expected to increase to \$269 million for 1997.
120. Jeff Erlich and Pat Cooper, 26.
121. "13 October," Chemical Weapons Convention Bulletin, December 1994, 27.
122. U.S. Army Medical Research Institute of Infectious Diseases 1969-1994, 9.
123. Perry, 261 and 266.
124. Pohling-Brown, 37.

125. Lacey, 125.
126. The President, A National Security Strategy of Engagement and Enlargement, 1995, iii.
127. Ibid., 104.
128. Arms Control and Disarmament Agency, Annual Report to Congress 1992, 1993, 48-49 and 70-78.
129. General Accounting Office, Arms Control: U.S. and International Efforts to Ban Biological Weapons, 1992, 63.
130. Toby T. Gati, Worldwide Threats to the United States, Statement by Assistant Secretary of State for Intelligence and Research presented before the U.S. Senate Select Committee on Intelligence, Washington, D.C., 10 January 1995, 2, 4-6, 11, and 18. Significant destabilizing trends concerning proliferation are Iran and Iraq WMD and missile programs in the Middle East; India and Pakistan nuclear program and missile capabilities; and North Korea nuclear program intentions.
131. H. Allen Holmes, "America's Approach to Special Operations," Defense 95, no. 1, (1995): 32.
132. Perry, 227. Their psychological operations can support deterrence by communicating to foreign audiences a U.S. commitment and capability to prevent the proliferation and use of WMD.
133. H. Allen Holmes and Wayne A. Downing, United States Special Operations Forces: Posture Statement, (Washington, D.C.: U.S. Department of Defense, 1994), 16-17, 47.
134. Joint Chiefs of Staff, Joint Warfare of the US Armed Forces, Joint Publication 1 (Washington, D.C.: U.S. Joint Chiefs of Staff, 11 November 1991), 1. See also, Department of the Army, The Army, Army Field Manual 100-1 (Washington, D.C.: U.S. Department of the Army, June 1994), 2; and Department of the Army, Operations, Army Field Manual 100-5 (Washington, D.C.: U.S. Department of the Army, 14 June 1993), 1-4. Also, see Conduct of the Persian Gulf War, 640. In December, 1990, U.S. Secretary of Defense Cheney echoed

presidential warnings if Iraq employed weapons of mass destruction during the liberation of Kuwait from Iraq: "...were Saddam Hussein foolish enough to use weapons of mass destruction, the U.S. response would be absolutely overwhelming and it would be devastating."

135. U.S. President. Public Papers of the Presidents of the United States, Book I - January 1, 1991 to June 30, 1991, (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1991), George Bush, 1991, 223. White House Statement on Weapons of Mass Destruction, March 7, 1991. The President stated, "The proliferation of weapons of mass destruction may profoundly challenge our national security in the 1990's."

136. U.S. President. Public Papers of the Presidents of the United States, Book II - August 1, 1992 to January 20, 1993, (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1993), George Bush, 1993, 1422. President Bush addressed the American Legion National Convention on August 25, 1992. "There will be other regional conflicts. There will be other Saddam Hussein's. Look around the world. Look at the threats we face: terrorism. the terrible drug cartels, regional conflicts as the breakup of empire gives vent to ancient hatreds, the spread of nuclear and chemical weapons. From Qadhafi in Libya to Kim Il-song in North Korea, the threats on our horizon could look a lot like the threat we turned back in Iraq."

137. U.S. President. Public Papers of the Presidents of the United States, Book I - January 1, 1991 to June 30, 1991, (Washington, D.C.: Office of the Federal Register, National Archives and Records Service, 1991), George Bush, 1991, 223. This White House statement on WMD was announced on 7 March 1991.

138. Perry, 71.

139. Perry, 44.

140. The President, A National Security Strategy of Engagement and Enlargement, 1995, 13-16.

141. Perry, 43.

142. Togo D. West, Jr. and Gordon R. Sullivan, The United States Army Modernization Plan: Update (FY95-99), 1994, 13-2.

143. Perry, 9 and 25.

144. Togo D. West, Jr. and Gordon R. Sullivan, The United States Army Modernization Plan: Update (FY95-99), 1994, 13-2.

145. Ibid., 3 and 9.

146. Carus, 35.

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